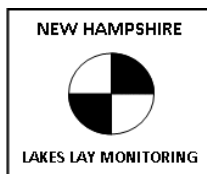


SQUAM LAKE

SITE 10 SANDWICH BAY 2013 SAMPLING HIGHLIGHTS

SANDWICH, NH



Light Blue = Outstanding
= Ultraoligotrophic

Blue = Excellent =
Oligotrophic

Yellow = Fair =
Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

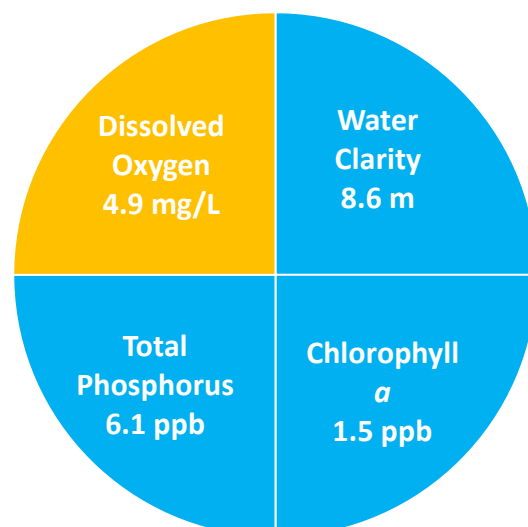


Figure 1. Average Water Quality Conditions

Squam Lake volunteers collected water quality data between June 3 and October 16, 2013 while more in depth water quality surveys of Site 10 Sandwich Bay were conducted by the **Center for Freshwater Biology** on June 19, July 17 and August 20, 2013.

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 8.6 meters (m) at Site 10 Sandwich Bay. The 2013 Site 10 Sandwich Bay water clarity increased relative to the 2012 water clarity readings.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 1.5 parts per billion (ppb) at Site 10 Sandwich Bay. The 2013 chlorophyll *a* concentrations decreased (less green water) relative to the 2012 readings.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 6.1 parts per billion (ppb) and remained below 10 ppb. A total phosphorus concentration of 10 ppb is considered sufficient to support green water events that are referred to as algal blooms.

DISSOLVED OXYGEN: Dissolved oxygen is important for healthy fisheries. Dissolved oxygen concentrations collected in the bottom waters ranged from 1.1 to 7.8 milligrams per liter (mg/L) on August 20. Dissolved oxygen concentrations included measurements below 5.0 mg/L that is considered the threshold for the growth and reproduction of coldwater fish, such as trout and salmon.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. Site 10 Sandwich Bay color averaged 10.2 color units (CPU).

ALKALINITY/pH: Alkalinity measures the resistance the lake has against acid rain. Site 10 Sandwich Bay alkalinity averaged 6.7 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The **pH**, a measure of lake acidity, at Site 10 Sandwich Bay ranged from 6.9 to 7.3 units and remained within the acceptable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 43 to 48 micro-Siemans per centimeter ($\mu\text{S}/\text{cm}$) at Site 10 Sandwich Bay. Specific conductivity indicates low to moderate concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: Squam Lake did not take part in the 2013 cyanobacteria monitoring program. Please refer to the recommendation section for further information.

Note: For a more detailed discussion of water quality measurements and a discussion on the inter-comparison of sample sites, please refer to the executive summary within the annual Squam Lake report.

Table 1. 2013 Squam Lake Site 10 Sandwich Bay Seasonal Average Water Quality Readings and Trophic Level Classification Criteria used by the New Hampshire Lakes Lay Monitoring Program

Parameter	Ultraoligo "Outstanding"	Oligo "Excellent"	Meso "Fair"	Eutrophic "Poor"	Site 10 Sandwich Bay Average (range)	Site 10 Sandwich Bay Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	8.6 meters (range: 7.2 – 10.1)	Ultraoligotrophic
Chlorophyll <i>a</i> (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	1.5 ppb (range: 0.9 – 2.8)	Ultraoligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	6.1 ppb (range: 5.5 – 7.3)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	4.9 mg/L (range: 1.1 – 7.8)	Mesotrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter ($\mu\text{g}/\text{l}$) lake water, and/or 70,000 cyanobacteria cells per milliliter lake water.			The New Hampshire Department of Environmental services posts warnings at State beaches when cyanobacteria cell numbers exceed 70,000 cells per milliliter lake water.		

* Dissolved oxygen concentrations taken from the bottom layers

LONG TERM WATER QUALITY TRENDS

WATER CLARITY: Water clarity has increased approximately 20 centimeters (cm) over the past thirty-four years of sampling. However, the trend is not statistically significant.

CHLOROPHYLL: The long-term chlorophyll *a* concentration has been relatively stable since 1979. However, the trend is not statistically significant.

COLOR: Color concentrations have decreased over the past twenty-six years of sampling. However, the trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has decreased approximately 1.0 ppb over twenty-one years of sampling. However, the trend is not statistically significant.

In summary, over the past thirty-four years of sampling the water quality has stayed relatively stable at Site 10 Sandwich Bay. The water clarity has increased slightly, while chlorophyll *a* concentrations have remained stable. Total phosphorus concentrations have been low and relatively stable in recent years and correspond to the relatively stable chlorophyll *a* concentrations.

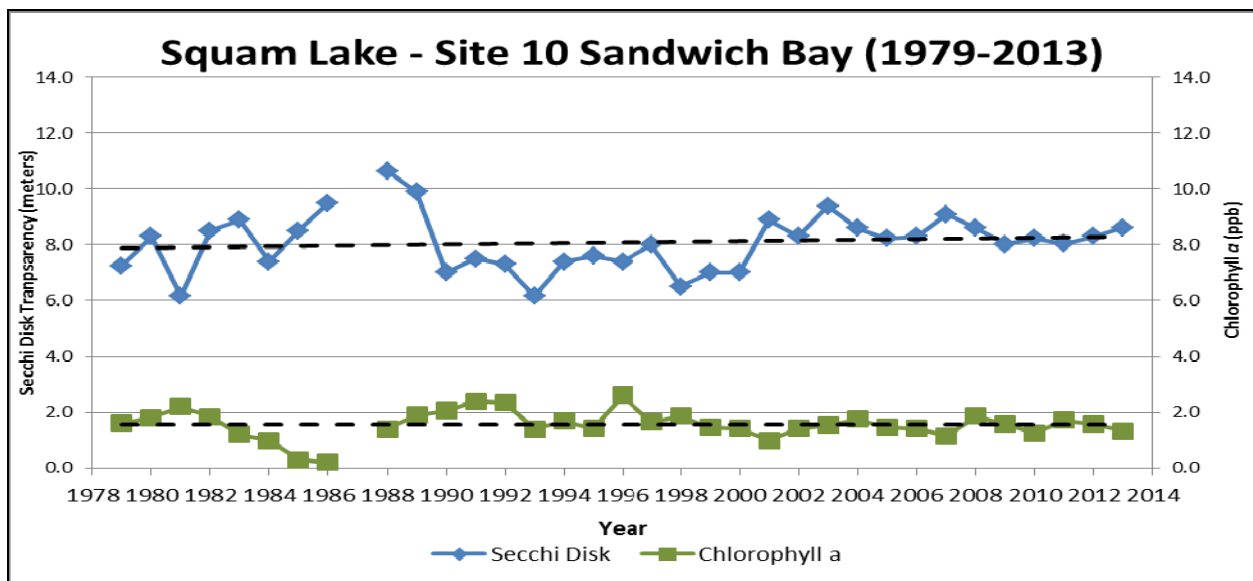


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1979 and 2013 at Site 10 Sandwich Bay. There has been an increasing water clarity trend with time, although the trend is not statistically significant (dashed line). Algal growth (chlorophyll *a*) has remained stable with a slightly decreasing trend since 1979; however, this trend is also shows no statistically significance (dashed line).

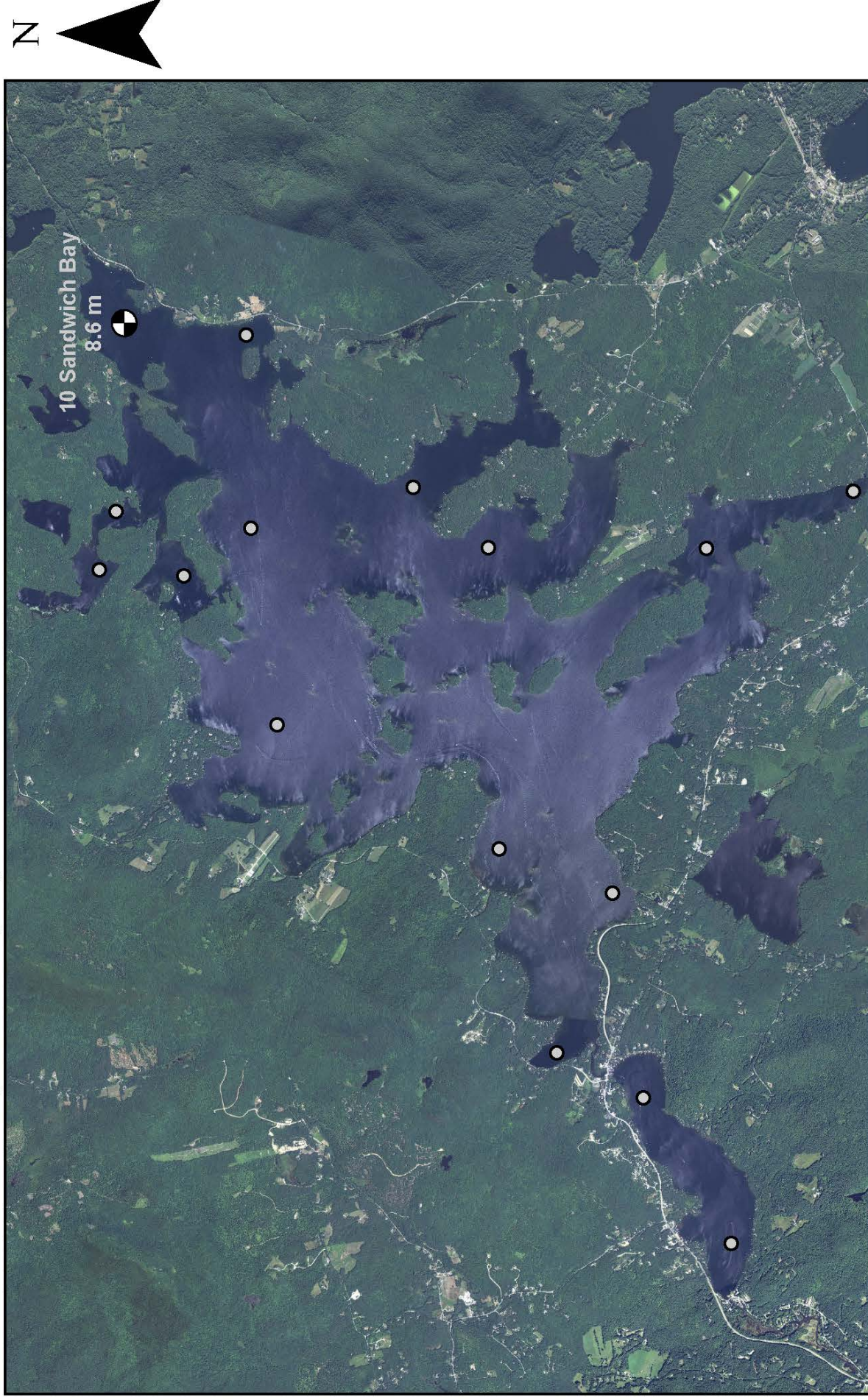
Recommendations:

- Conduct early season sampling (April/May) to document Squam's reaction to periods of high stream flow during and after spring thaw.
- Implement a simple cyanobacteria-monitoring routine into the conventional water quality monitoring methods including monthly water samples. Cyanobacteria collections throughout the summer and fall months can give insight as to how these populations are distributed throughout the seasons and when they are most likely to be at harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact Bob Craycraft by phone, 862-3696, or via email, bob.craycraft@unh.edu
- Implement Best Management Practices within the Squam Lake watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.
 - https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf
 - <http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf>

Squam Lakes - Site 10 Sandwich Bay

Sandwich, NH

2013 Deep water sampling site locations with annual seasonal water clarity



0 0.3 0.6 1.2 1.8 2.4 Miles



UNIVERSITY
of NEW HAMPSHIRE
Cooperative Extension

Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center of Freshwater Biology